



RECYCLING

RECYCLING NEWSLETTER

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SPE Recycling

If you're on LinkedIn, or any social media, you'll notice that your feed slowly becomes more homogenous, at least in terms of subject matter. After several years of clicking on links about plastics, recycling, sustainability, circular economy, etc. and following many people who write and post about those topics, it appears that I have perhaps reached peak plastics. Other than the occasional humorous meme or click-bait thread designed to polarize, the vast majority of what I see is within the nexus of plastics and sustainability. It's a good thing I like that topic.

Recently, LEGO posted details about a breakthrough in using recycled PET for some bricks. This was an interesting development given that LEGOs are traditionally made from ABS. The comments, however, revealed a wide array of opinions, informed and otherwise, about this development. To paraphrase: it took hundreds of engineers and hundreds of trials to arrive at a recycled material that would meet LEGO's exacting standards. But this wasn't fast enough or good enough for the chatterati. Of course, the irony is that LEGO lasts "forever" because the material is superb and because people assign value to the blocks and keep them for years, even generations.

Replacing virgin material with recycled material almost always reduces its environmental footprint, but not always. Processing energy required to reclaim and reprocess materials can dent an LCA. High efficiencies with PE and PP, in particular, mean that they are very difficult to supplant in terms of footprint.

Form and function, arguably the twin pillars of design success, must remain important. Yet designers are starting to look further afield. Incorporating Design for Environment principles at the very beginning of a product's life cycle is pivotal to creating sustainable products and packages. Here are some elements that could be considered beyond simple utilitarianism:

- **Optimize resource efficiency:** How can we do more with less? If we do, will we create a Jevons Paradox?



- **Use of non-fossil resources:** Is a bio-based option preferable, given the form and function of the part in question? Do we understand the end-of-life considerations of the bio-based material?
- **Life-cycle impact assessment:** Though they are not without their challenges, LCAs offer data that can be used when measuring the environmental impact of two material options. They sometimes reveal uncomfortable findings, including higher impact scores for some biobased materials due to their reliance on fertilizers and pesticides which can lead to acidification and eutrophication.
- **End-of-life:** This has been lacking in design considerations until recently. If an item is easily recycled within a given infrastructure, is this the best option even if the material is fossil fuel-based? What about post-life impacts on human and ecological systems?

At its core, sustainability means that we—today—cannot compromise the ability of future generations to sustain themselves. The Iroquois lived by the Seventh Generation Principle: "In our every deliberation, we must consider the impact of our decisions on the next seven generations." In a world where forecasts have proliferated with the advent of Big Data and predictive algorithms, one would be forgiven for thinking that we can surely do better when it comes to our shared planetary responsibilities. The core of plastics and sustainability, therefore, is the measurement of the impact of our material choices on the environment. If everything is equally important, then nothing is important. We must work with what we have, and develop tools to assess, measure, and manage our choices. Some choices will be hard, and they will be sub-optimal, but we cannot let the perfect be the enemy of the good. |

Moving Toward 'Widely Recycled'

By Steve Navedo, Navedo Management Group

Editor's Note: We are grateful to Dan Lief, editor of *Resource Recycling*, for making this article available to SPE Thermoforming Division members. This article originally ran in the Spring 2021 edition of *Plastics Recycling Update* magazine. Find more from *Plastics Recycling Update* at resource-recycling.com/plastics. We invite interested members to attend the publication's *Plastics Recycling Conference* March 7-9, 2022 outside Washington, D.C. All the conference details are at plasticsrecycling.com.

Consumer guidance from the recycling industry often goes something like this: "If you are not sure if something is recyclable, don't put it in the recycling bin – because it's better to not recycle than to attempt to recycle a contaminant."

That advice is critically important for protecting the materials that have well-developed and cost-effective routes of flowing through the recycling stream. But it also raises a dilemma when trying to bolster recycling of a material such as the PET thermoform, which holds great opportunity for development in the recycling marketplace but which needs more clarity about its acceptance in local programs.

This article will explore the fundamental issues that have led to barriers in terms of bringing more thermoforms into the plastics recycling system. It will also offer advice for addressing these problems.

Technical Considerations

There are technical-level recycling differences between a clear plastic bottle and a clear plastic clamshell, and this is the first hurdle in growing thermoform recycling in the U.S.

First is the inconsistency of plastic resins used in manufacturing thermoforms – this is one of the biggest reasons thermoforms are not universally recycled. Although PET is the recycling industry's preferred resin, the percentage of thermoforms made from OPS (oriented polystyrene) is still

significant. In addition, some thermoform manufacturers use other PET look-alikes, such as PLA, PVC and PETG.

Labels and glue stand out as another critical technical issue. There is little uniformity in the labels used on thermoformed plastic containers, and this variation in label choices includes the continued use of recycling-unfavorable paper labels. For the purposes of PET recycling, the most advantageous label substrates are polyolefin-based, most commonly polypropylene. This is because the PP will float in water, whereas PET will sink, facilitating separation during wash in the reclamation phase.

Additionally, the glue used on thermoforms is much more aggressive than glue used on bottle labels. In many cases, the glue extends to every square inch of the label, making it more difficult to remove from the PET container (or the PET flake once ground). The residue from adhesives also has a tendency to taint the water solution used in washing the PET flake.

The third area of technical concern is intrinsic viscosity. The IV, a measure of a plastic's tensile strength or elasticity, for PET thermoforms is generally low compared to that of PET bottles, creating challenges when bottles and clamshells are processed together. However, the IV of the post-consumer thermoform regrind can be increased after washing – by solid-stating in the decontamination and upgrading stage – to accommodate end use applications, such as PET bottles, that require a higher IV than the IV of the sheet used to manufacture the thermoforms.

Finally, the thinness of thermoform containers causes a "bulk density" concern in the reclamation process (this issue is also seen when processing single-serve water bottles). Plastic bottles and containers are ground into flake form prior to washing, and if the flakes are too light, they have problems flowing readily through the wash process.

Reclaimers can mix and blend the lighter regrind with the thicker bottle flake to raise the overall bulk density. In this step, the blending needs to be vigorous to create a homogeneous mix to prevent slugs of varying bulk densities going through the system. Alternatively, reclaimers can modify their wash lines to compensate for higher percentages of lighter regrind.

The beverage industry has used a “triple bottom line” approach to the plastic packaging debate for much longer than the “non-bottle rigid” community. In the process, beverage container stakeholders have invested time and money, both pushing back societal attacks, as well as actively collaborating with the recycling industry. A clear market for recycled material also developed: thanks to direct food contact approval, label testing, light-weighting and bottle bills, plastic beverage bottles catalyzed post-consumer plastics’ entry into direct-contact food packaging.

In short, the plastic beverage bottle industry set a standard for post-consumer plastic recycling. In the late 1990s The American Plastics Council (today, the Plastics Division of the American Chemistry Council) created the All Bottles Program. Since 95% of all plastic bottles were made of recycling friendly PET or HDPE at the time, a simple public message to recycle all plastic bottles was employed. Unfortunately, this strategy worked to the detriment of communicating recyclability for all other plastic packaging, including PET thermoforms.

Today, virtually every recycling program accepts PET and HDPE bottles for reclamation. This development should serve as a template for other non-bottle plastic rigids. Specifically, thermoformed PET plastic packages must achieve social acceptance as “recycling friendly,” comparable to the technically compatible single-serve plastic water bottle. In partnership with relevant stakeholders, PET thermoforms should, at a minimum, move beyond How2Recycle’s “check locally” classification to the “widely recycled” status held by plastic beverage bottles.

In developing a plan for progress, it’s smart to ask the following question: How did plastic beverage bottles become the preferred recycling package? As noted, the beverage industry collaborated with the plastics recycling industry. For

instance, both Coke and Pepsi were long-standing members of the Association of Plastic Recyclers (APR) Technical Committee. The beverage giants discussed, negotiated, and came to terms with the technical hurdles that challenged the recycling industry.

A number of examples underscore the work done to ensure bottle recyclability. Bottle makers eliminated the big black HDPE base cup that served as the pedestal of highly popular 2-liter containers. Aluminum caps gave way to PET recycling-friendly PP caps. Paper labels vanished, replaced by PP labels, which eventually became smaller and more transparent. The practice of using heaps of glue was replaced with a couple of strategic dots of adhesive.

This type of recycling-oriented product modification, on a collaborative stakeholder level, is the paradigm shift needed for the thermoform industry to overcome pushback from the recycling community.

A Growing Need for Material

Although the recycling industry demand for post-consumer thermoforms remains murky due to technical challenges, the demand for recycled PET (rPET) is crystal clear.

Brand company commitment for increased post-consumer content in packaging has never been higher. Many consumer-goods companies and retailers have committed to increase recycled content in their packaging to an average of 25% by 2025, compared to the current global average of 2%, according to the Ellen MacArthur Foundation.

As the most recycled plastic globally, PET is the key to increasing recycled plastic content in packaging, particularly in food packaging. Regrettably, the U.S. recycling rate for PET plastic bottles remains stagnant, under 30%, which is not nearly enough to satisfy the CPG demand for recycled content. Today, over 1 billion pounds of PET is used annually to manufacture sheet and film – this supplemental volume of available post-consumer plastic can no longer be ignored.

The plastics industry and its partnering stakeholders must venture their recycling efforts beyond just plastic bottles,

and step up their accountability for responsible after-use management of plastic packaging. Failing to do so invites extended producer responsibility mandates for packaging. PET thermoforms are “low hanging fruit” for plastic recycling, with the potential to add hundreds of millions of quality pounds back into the global rPET supply stream.

Recovering the thermoform material will require a collaborative stakeholder value chain.

Ultimately, each stakeholder compromise will promote the greater good of higher plastic packaging recycling rates. In addition, the intrinsic cost for recycled content should be proportional to the commercial benefits earned from post-consumer recycling’s halo effect.

Time for Coordinated Outreach

Below is a look at the six key stakeholder groups in thermoform recycling and what each category requires for greater engagement:

Consumer: Consumers are the ones who choose whether or not to move material into the recycling system to start with, and they need an education campaign that explains PET thermoforms are recyclable and collected in their community for recycling. This education could be complemented by a widespread “Buy Recycled” marketing blitz (the Foundation for Plastic Recycling has in fact already begun a “Buy Recycled” effort.)

Materials Recovery Facility: Outreach to MRFs must stress that there is a viable domestic market for collected thermoforms, either in segregated bales or contained at a designated percentage in post-consumer PET bales. At the same time, increased grant opportunities from government and industry could encourage additional investments to accommodate an increased PET thermoform collection stream.

Reclaimer: At the reclaimer level, operators require assurances that increased PET thermoform volumes will lead to ROI that justifies upgrades made to existing PET recycling operations, including the addition of thermoform-dedicated recycling systems. Reclaimers all need to be confident that incoming material supply will fulfill benchmarked quality specifications.

Converter/Thermoformer: Sustainability awareness and technical collaboration with packaging design engineers is necessary to create more recycling-compatible package designs. Also necessary is outreach encouraging converters to incorporate more post-consumer content in their packaging, with favorable awareness of post-consumer resins’ distinguishing quality specifications and pricing structure. It is important to mention that post-consumer resin is not a traditional “commodity” because product quality and specifications are source dependent. Post-consumer resin is more akin to a value-added “specialty resin” than it is to an ordinary commodity.

Brand Company: Brands also need outreach to push them to incorporate more post-consumer content in their packaging, with a favorable understanding of post-consumer content specifications and pricing structure.

Retailers: Retail stakeholders need to require vendors who want to sell in their stores to use rPET or PET with recycling friendly labels in their thermoformed packaging. It’s also worth noting that employees working in supermarkets are often the direct recipients of consumer complaints over plastic packaging. At a minimum, they should be able to reply that their packages are recyclable in their own community.

Unfortunately, consumers are at a disadvantage in their understanding of “what is” and “what is not” recyclable. Many do not know that PET thermoforms are 100% recyclable. Ultimately, the public is restricted to those postconsumer materials their local recycling programs are willing to pick up.

The beverage industry’s current “Every Bottle Back” campaign reflects a commercially preemptive prototype that should put them in good stead as legislative mandates are developed. The thermoform industry, as such, has never organized a national eco-centric promotion. It is not practical to deliver a national recycling message for thermoforms while they fall under that mixed bag of recyclables accepted or rejected for collection at the local level.

Unfortunately, thermoforms do not benefit from a centralized deep pocket benefactor group, as the beverage industry’s endorsement of plastic bottles. However, thermoform

packaging can benefit from the collaborative stakeholder strategy described above. This value chain is robust enough to effectively increase post-consumer plastic packaging recycling rates and divert millions of pounds of scrap plastic waste from our lands and waterways.

Unleash the Arsenal

If extended producer responsibility policies take hold in the U.S., as is expected, and corporate stakeholders are held responsible for the after-use management of their packaging, it behooves them to take the lead on this effort and administer programs that are effective and sustainable for the consumer, the environment and their businesses.

Client stakeholders must demand sustainable goods and services from their suppliers and service providers. It is critical for corporate stakeholders to exhibit responsible service and product stewardship while remaining actively engaged in the regulatory process.

It's also worth noting that a national bottle bill would increase the recycling rate and cure the supply shortage for the recycling industry, but concurrently such a system would remove reclaimer incentive to accommodate thermoforms into the recycling stream. Further, beverage industry resistance to a national deposit proposal would suck up sig-

nificant resources, money and time better spent in helpful collaboration than in steadfast opposition. Moreover, the post-consumer thermoform waste problem would still exist.

Voluntarily increasing thermoform package recycling is one key step to address the plastic waste problem, and it is in the best interest of the plastics, food, CPG and recycling industries to make this happen now.

A common saying in the recycling industry is that "there is no silver bullet" to fix the post-consumer plastics problem. This rings true for the issue of increasing thermoform recycling: any effort should incorporate a full arsenal of environmentally sound, economically practical and socially sustainable strategies. Hopefully, deployment of a variety of complementary efforts will culminate with an unconditional "Widely Recycled" label on every clear plastic PET thermoform.

Steve Navedo is a corporate sustainability veteran who has dedicated over 30 years to plastics reclamation, sustainable packaging and promoting the growth of the nation's recycling infrastructure. Currently an independent consultant, he is president of the Navedo Management Group and can be contacted at steve@navedogroup.com. |



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5 Questions for W. Ripple, VP Sustainability at Avient Corporation

Can you tell us how your role has evolved at Avient?

The creation of a senior level Sustainability role demonstrates the importance Avient has placed on Sustainability. My role as Vice President, Sustainability, is to drive a comprehensive Avient sustainability strategy and to lead initiatives that help customers and Avient achieve sustainability and performance goals.

Sustainability megatrends and the challenges associated with them were becoming increasingly important to the planet, and for our customers, and I wanted to be a catalyst for driving Avient's strategy to do our part. I aim to ensure our efforts continue to align with the dynamic changes in the industry, emerging innovation and the shared responsibility of taking care of the planet.

In July of last year, we purchased the Clariant Masterbatch business and changed our name. The idea was that two companies were coming together, who were leaders in both our industries, so we formed under a new name called Avient. A big component of that is the sustainable solution set that we offer. We've focused on helping customers meet their sustainability goals, be it reducing weight, improving recyclability, or lightweighting. And we are also focusing on Avient's long-term sustainability strategy. We've set 2030 sustainability targets to combat the negative impacts of climate change, and further commit to a more sustainable planet.

What are the top 3 initiatives that Avient is currently working on?

It's difficult to boil down all of Avient's sustainability initiatives into just 3, but I can share the top 3 most important initiatives that span across the four pillars our sustainability strategy: People, Product, Planet, and Performance.

Starting with Planet, climate change continues to be one of the defining issues of our time, and we are dedicated to do our part. Our 2030 Sustainability Goals include targets to reduce greenhouse gasses and increase our use of renewable



energy, and we are making progress in each—reducing our carbon emissions by 37% since 2019, and increasing our renewable energy usage up to 31% of our energy needs. These efforts are also aligned with our commitments as an ACC Responsible Care® company. Additionally, we are an active and founding member of the Alliance to End Plastic Waste, which is dedicated to ending plastic waste in the environment.

Another way we help mitigate climate change is through innovation and helping our customers meet their sustainability goals. Our sustainability portfolio includes eight different ways we help our customers achieve their sustainability goals, from advancing a circular economy through improved recyclability, to lightweighting, to enabling sustainable infrastructure, or enhancing bio-polymer solutions to name a few.

Lastly, we believe a sustainable culture is the key to a sustainable company. With guidance and support from the Avient Board of Directors, we have been directing actions and programs to change how our organization views, values and creates diversity in the workforce. Additionally, Avient provides training and development opportunities to all associates globally, full and part-time. These opportunities work to ensure a consistent and high-quality experience for associates—all to unleash their full potential at work.

How does your work in masterbatches contribute to the larger interplay of plastics and sustainability?

At Avient, we are not polymer producers. We are formulators that provide an important bridge from polymers and other technologies to brand owners, in order to help them meet their innovation and sustainability goals. Our masterbatches and additives enable our customers to meet sustainability targets, like improving recyclability, lightweighting, enabling

renewable energy and more. With regard to advancing a circular economy, we offer masterbatches that make customers' packages more recyclable. We developed additives and masterbatches that improve the recycling process, such as anti-oxidant systems and viscosity builders that recyclers can use to improve the mechanical properties and keep more recycled material in the recycling stream. In terms of customers who are looking to improve recycled content, we have masterbatches, additives and toners that can improve the natural yellowing that happens when adding more recycled content. Our investment in the Clariant Masterbatch business in 2020 further solidified our leading position in solutions that enable a circular economy. Our combined portfolio is well suited to enable our customers' goals.

Can you share an example of how a sustainability program or initiative has contributed to the bottom line?

It's no secret that diverse and inclusive organizations attract and retain better talent, are more innovative, and are also among the best performing. Last year, over 7,400 Avient associates participated in the Great Place to Work survey, representing over 40 countries. Our scores once again earned us the distinction as a Great Place to Work® by the Great Place to Work Institute. Additionally, our employee retention, talent acquisition, Equity Index continue to drive results in all four of our sustainability cornerstones.

Avient solutions that enable our customers' sustainability goals grow their business, as well as our business. Avient's focus on mitigating our impact to the planet and driving aggressive environmental key performance indicators are in alignment with our stakeholders' expectations, and help drive operational efficiencies for our company.

What advice would you give to someone seeking a sustainability-related role at a plastics / polymer company today?

In order to be successful at a sustainability-related role in the plastics industry, one must lead with passion and stay connected to a solid purpose. They have to be willing to take courageous action when it comes to creating a sustainability strategy that will make an impact, and they should feel comfortable challenging the norm. Networking within the industry and making connections is also critical. |

New Plastics Economy: A Summary Report from Australia

The SPE Australia - New Zealand Division is one of the most active groups in SPE. The group recently completed a 10-part webinar series in collaboration with the Royal Australian Chemical Institute.

This month, Division President, Han Michel, offered a summary of the most recent developments at the Ellen MacArthur Foundation's New Plastic Economy. We are pleased to reprint Han's comments in their entirety for SPE Recycling Division members.

For more information about the Division, visit www.plastics.org.au

The first session was attended by close to 2500 attendees. There were quite a number of important speakers from large global retailers, food and beverage companies, global finance companies, science, former and current leaders of global organisations and more and, of course, presenters from the Ellen MacArthur Foundation headed by its Founder, Dame Ellen MacArthur.

The most important link, which was made at the first session of this EMF webinar series which was kicked-off by the former Executive Secretary of the UN Convention on Climate Change, Christiana Figueres, was the **link between plastics and climate change**, demonstrated by Nestle with its CEO, Mark Schneider, and the President of Food and Refreshment of Unilever, Hanneke Faber. It suggested the need for a strengthening of our efforts to reduce the use of plastics through design and re-use, basically emphasising the issue of scarce resources on our planet. What struck me were the new links made for plastics such as **the need for diversification of foods, the need for stopping deforestation and the need for not using more resources but making more revenue by re-using products already in circulation**. The influence by the finance sector on changing our supply chains was mentioned.

In session two, **Dame Ellen MacArthur was impressive:**

she said that a race to the bottom by bringing prices down for the same products won't make a company winner; a company will eventually create better results in the long term when jumping to changing the supply chain and preserving resources; unfortunately, such changes are not without risk.

In this session the finance industry (Black Rock and Morgan Stanley) made their intentions clear and said that **they will be leading the change to sustainability and forcing companies to adopt new supply chain models using less resources and reducing consumption; in this session the stepping out of coal and non-renewable resources were mentioned as significant factors of change in society.**

H&M and Ikea are examples of companies where supply chains are being changed by designing products for re-use and taking back used products from consumers. Many more impressive companies and speakers were all emphasizing change and walking the talk.

These changes are all in line with what leading packaging companies such as Nestlé and Unilever are doing already **by changing designs for re-use and recycling and reducing consumption of materials.** Also in this session, the link of the Circular Economy and Climate Change was mentioned.

Session three was interesting because of the confirmation that large companies in (plastics) packaging expect change.

A remark by James Quincey, the CEO of Coca-Cola, was that he expects that capitalism needs to change and also that the **massive changes required in packaging and behaviour will require some degree of regulation.** The focus on no waste and no carbon footprint needs to become an integral part of our supply chains, i.e. industry, government, society and citizens need to collaborate.

Others mentioned that we don't have a circular economy yet and **there is a need for integrated decisions with speed,** i.e. all in the supply chain must work together and go from economy to ecology whilst maintaining our biodiversity which is challenged by climate change.

Another interesting presentation came from Alysia Garmulawicz from the University of Santiago de Chile with a company called Materiom (look them up!) who works

together with Liz Corbin from Metabolic (formerly University College London). I copy here a few sentences of what they do:

“Step into a forest. Dive under the ocean. All the biomass around you - all the living and dying and building of habitat - is a vast and continual production of materials. And yet forests have no landfill, the ocean no wastewater. **For billions of years, plants and animals have evolved to make materials with a particular set of ingredients that other organisms know how to source, use, breakdown, and use again.** It's time we took notes.

Materiom provides open source recipes and data on materials made from abundant sources of natural ingredients, like agricultural waste. By making this knowledge open, we accelerate materials development and lower barriers to entry in materials markets around the world. We work with companies, cities and communities to support the development of local biomaterial supply chains that nourish local ecologies and economies.”

“They see this as an opportunity to cultivate an **alternative materials economy: one that is regenerative rather than extractive, restorative rather than destructive, and empowering rather than alienating.**”

What struck me also in this session is **the link of the circular economy with climate change and the emphasis on the need for collaboration in supply chains with urgency.**

With kind regards,

Han Michel

President

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For more information or questions, contact Conor Carlin, Editor, at ccarlin@4spe.org or 617.771.3321.



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